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TECHNICAL REVIEW COMMENTS

on the

ENVIRONMENTAL IMPACT STATEMENT

for the proposed

LONE PINE RESOURCES LTD.

GREAT SAND HILLS NATURAL GAS DEVELOPMENT

Environmental Assessment Branch

Saskatchewan Environment and Public Safety

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1.0 INTRODUCTION

The primary goal of an Environmental Impact Assessment (EIA) is to provide the information necessary for governmental decision-makers to determine whether, from an environmental perspective, a proposed development should be allowed to proceed and, if so, under what conditions. As part of the EIA process, the project proponent is required to prepare an Environmental Impact Statement (EIS). The EIS documents the proponent's conclusions about how the project is likely to affect the environment (biophysical and socio-economic), and it describes the measures the proponent will take to mitigate any negative environmental impacts and to enhance positive impacts. After the EIS is reviewed by governmental agencies and deemed to be technically accurate, the project documents are made available for public review and comment along with Saskatchewan Environment and Public Safety's Technical Review Comments. Input from the public, together with information generated during technical review of project data, is provided to the Minister of Environment and Public Safety for consideration in determining whether a project will be allowed to proceed. At any time during the review process before a decision on approval is made, the Minister may require public information meetings to be held or may convene a public inquiry.

To assist both the public and governmental decision-makers in reviewing the EIS and evaluating the environmental acceptability of the proposed development, Saskatchewan Environment and Public Safety prepares a written commentary on the project. These Technical Review Comments represent the department's evaluation of the proponent's conclusions regarding the environmental impacts predicted, the significance of these impacts, and the effectiveness of proposed mitigative measures. In preparing the comments, the department focuses on those areas of the development

considered to be of primary significance with respect to the proposed development.

The EIA was required to incorporate necessary project details and environmental-protection measures in as much detail as possible. It was recognized, however, that development of these facilities would occur on an as-required basis, over a number of years, and that final-design project details, including locations and environmental-protection measures, would not be available for the entire project area at the time of the EIA. Additionally, the proponent would require and indeed would benefit from having the flexibility to allow new technologies and new environmental-protection and mitigative measures, including those developed during early parts of this program, to be applied to the latter project phases. The EIS includes preliminary analyses of the impacts associated with potential development plans for the balance of the lease area.

The EIA accordingly was to address project details and mitigative measures in as much detail as was feasible. This stipulation notwithstanding, descriptions of procedures, criteria, principles, and commitments were to be provided in lieu of detailed design where such design could not reasonably be expected at this time (i.e., for later project phases). If the project is approved, a detailed review of these later phases, including evaluation of the impacts and associated mitigation of earlier phases, would be required prior to construction of these later phases. Detailed plans for the construction, operation, monitoring, reclamation and decommissioning of these proposed facilities would be required, and construction of these facilities would not be permitted without the prior written consent of the Minister. The ability to develop all or part of the later phases would depend on project-specific details, environmental impacts of earlier phases, and the developer's demonstrated success in

developing earlier phases in an environmentally acceptable manner.

The above considerations and safeguards ensure detailed review of project-specific details at the time that such planning is most effective - i.e., shortly prior to implementation, when project details are known with certainty and all involved (proponent, public and government) are able to make maximum use of experience gained in the area to date. The phased planning approach and need for periodic review of new project phases was anticipated at the time the impact assessment was initiated. Accordingly, provisions would be in place to ensure any necessary, long-term re-evaluations necessary for environmental protection if the project as proposed receives an overall ministerial approval.

The Minister of Environment and Public Safety imposed a temporary moratorium on new land uses, including gas exploration and development, in a defined "highest sensitivity" area in the northern part of the Great Sand Hills between July, 1990 and May, 1991. Four sections of Lone Pine's proposed development area (S. 28, 31, 32, and 33, T.17, R.23, W3M) were included in the moratorium area, and this part of the proposal was directly affected by the moratorium and the resultant land-use strategy (**Great Sand Hills Land Use Strategy, May 1991**). The most important direct result in the withdrawal of Sections 28, 32 and 33 from gas development, with these sections to form part of the "core" of the Rastad Prime Protection Area (PPA). Any Ministerial Approval for this project will exclude these three sections from development. Negotiations with mineral holders, including

Lone Pine Resources, are ongoing to complete the definition of the total 21-section area of the Rastad PPA. Relevant recommendations from the land-use study and the land-use strategy would apply to the entire Lone Pine project if it receives ministerial approval. Such recommendations would affect both the initial phases discussed in detail in this assessment and subsequent phases not yet elaborated upon in detail.

2.0 PROJECT DESCRIPTION

Lone Pine Resources Ltd. ("Lone Pine") is proposing to construct and operate a natural gas production and transportation system in a mineral lease area of about 32.25 sections in T. 15, 16, 17, R. 23 and 24, W3M, in the Freefight Lake area of the Great Sand Hills northeast of Maple Creek and east of Highway 21. (The area subject to the EIA is part of a larger mineral lease held by Lone Pine.) Considerable gas development has already been undertaken by Lone Pine and other developers on less environmentally sensitive areas in the vicinity of the current project area, based on review of detailed proposals [Environmental Protection Plans (EPP)].

Development of the field could potentially involve drilling of 266 gas wells at 80-acre spacing, and the installation of a pipeline and trail system to service the producing wells. Lone Pine's initial development proposal consists of 58 gas wells at 160-acre spacing, with associated infrastructure. (These figures on potential development include the three-section area in the core of the Rastad PPA, on which no surface development may occur.) The balance of Lone Pine's mineral holdings, and the impacts of 80-acre spacing on any or

all of the development area, have not yet been evaluated in detail.

Each proposed well location would have a shallow (about 500 m deep) natural gas well, and each well would be tied into an access trail and pipeline network. There may be up to eight such well locations per section, although current plans call for only four wells per section. Subsequent to drilling, completions, and tie-ins, the wells would be operated for a period estimated at 25 years. Facilities in the EIA area probably would be constructed over a period of several years, with only a relatively few wells constructed per year.

Pipeline construction would entail placement of a gathering and pipeline system connecting each well to the existing trunk pipeline and compressor station serving both the Lone Pine project and the smaller, adjacent development of Ocelot Industries Inc. Permanent access trails to each well location would usually occupy common rights-of-way with flowlines and pipelines.

Following completion of construction, disturbed well sites and possibly some flowline/pipeline rights-of way would be fenced and necessary reclamation, erosion-control, and revegetation measures implemented. These measures would continue for several years, until revegetation standards are met. For the balance of the operational period the above-ground physical presence would be minor, consisting of well heads, pipeline headers, low-profile trails, and periodic inspection/ monitoring of each wellsite. There would be no ongoing

resource commitment or consumption of environmental concern during the operational phase.

3.0 BIO-PHYSICAL CONSIDERATIONS

The primary above-ground environmental concerns associated with a development of this type relate to the construction and immediate post-construction period. In the case of Lone Pine's proposal, these potential bio-physical impacts may be categorized as follows: impacts on terrain (including potential impacts on plant communities and erosion-control and revegetation requirements), potential impacts on wildlife, and potential impacts on surface and ground water. There would be no significant bio-physical environmental impacts associated with continued production of the natural gas (that is, during the operational period). The resource is entirely sub-surface and is managed for maximum efficiency of recovery and long-term production potential by Saskatchewan Energy and Mines.

The thin vegetation, poorly developed soils, and wind exposure renders the project area vulnerable to disturbance from any source, including, but not limited to, gas development. Accordingly, well development, pipeline construction, and repeated use of access trails in areas of unstable soils could result in surface disturbance. Diligent application of environmental-protection measures, including detailed advance planning, on-site monitoring, measures to reduce and avoid disturbance during construction, implementation of erosion-control measures prior to occurrence of erosion, and aggressive measures to revegetate and otherwise stabilize all disturbed sites are necessary to prevent wind erosion.

Lone Pine and its corporate associate, Ocelot Energy Inc., have substantial successful experience in developing and operating gas-development projects on sandy soils, including areas adjacent to the current project area. The impact statement documents the company's detailed site planning undertaken to minimize the potential for surface disturbance and wind erosion on the currently proposed project. In the course of earlier work in less environmentally sensitive areas of the sand hills, Lone Pine also has developed a variety of measures to ensure that surface disturbance would be minimized and restored.

The following construction-period calculations are very approximate, and are intended to portray a worst-case estimate of direct environmental impact. The calculations assume that the entire 29.25-section area addressed by the EIS (exclusive of the area to be included in the Rastad PPA) will be developed at the maximum allowable rate of 8 wells per section. (Lone Pine's assessment currently addresses 58 wells.) An estimated maximum of 0.5 ha will be disturbed at each wellsite (disturbance includes excavation, trampling of vegetation and soil compaction). It is further assumed that a maximum of 1 ha per well will be affected by pipeline construction and access routes. A total area of (29.25 sections x 8 wells per section x 0.5 ha disturbed per well) + 29.25 sections x 8 wells per section x 1.0 ha disturbed per well) = 351 ha (or about 1.35 sections) that would be affected temporarily by construction. This is about 4.6 per cent of the total project area. This area is reduced significantly as many of the access/pipeline rights-of-way will follow existing trails, and much of the disturbed area will retain its

vegetative cover. Areas affected directly post-reclamation (operational period) will be much smaller.

Saskatchewan Environment and Public Safety and other provincial agencies involved with management of public lands require that areas disturbed by industrial development in areas of native prairie be revegetated with native grass species. Aggressive, agronomic species such as crested wheat grass are not considered acceptable for this purpose. This policy is in accordance with the principles of conservation as outlined in the Prairie Conservation Action Plan. Standards of reclamation success specified in the **Great Sand Hills Land Use Strategy** will apply to the current project if Ministerial Approval is granted.

Saskatchewan Environment and Public Safety believes that the mitigative measures proposed by Lone Pine will successfully avoid and, where necessary, reclaim, surface disturbance without creation of long-term erosion hazards or other significant impacts on the terrain, vegetation or ecosystem. It is expected that over time reclamation using native species, plus normal ecological processes including serial changes in vegetational composition, coupled with other measures integral to Lone Pine's proposal (e.g., minimizing disturbance, erosion control, and post-project monitoring and remediation for as long as required) would result in a revegetated and reclaimed project area virtually indistinguishable vegetationally and topographically from surrounding areas unaffected by this project. The department wishes to emphasize the importance attached to preservation of

this area and to ensuring that reclamation commitments, objectives and standards are in fact met.

The entire project area is important wildlife habitat, and is formally designated as Critical Wildlife Habitat in The Critical Wildlife Habitat Protection Amendment Act, 1988. According to The Critical Wildlife Habitat Protection Act and The Critical Wildlife Habitat Protection Amendment Act, 1984, projects such as that proposed by Lone Pine are "permitted activities" on Critical Wildlife Habitat lands. In the current project area, the wildlife species of concern are mule and white-tailed deer, pronghorn, sharp-tailed grouse, and raptors such as ferruginous hawks. Any development in or near those areas considered key habitat components (e.g., leks, winter habitat, nesting trees) would be permitted only if and when the work could be accomplished without either excessively disturbing the animals involved and/or deleteriously affecting the habitat. Project areas have been identified where such restrictions would apply, and Lone Pine would be required to undertake surveys and enter into discussions with Wildlife Branch prior to undertaking any development in such areas of concern. Post-development surveys would also be required.

While it is believed that the proposed project can be constructed and operated with only minor impacts on wildlife, monitoring would be required to determine the extent to which the predicted impacts are in fact realized and the extent to which mitigative measures are effective. Monitoring data would be compared with pre-project (baseline) data and wildlife distribution and population data gathered for the larger sand hills area by governmental agencies for wildlife-

management purposes. The initial phase of the proposed project avoids the most environmentally sensitive parts of the proposed total development area and the areas of greatest value to wildlife. Future reviews to determine acceptability of any development proposals in that portion of the project area not addressed in detail in this EIS would include evaluation of the extent to which initial development has affected wildlife populations.

Concern has been raised regarding the potential for increased ease of access along the proposed project's trails to allow greater hunting effort and hunter success. While the Lone Pine project is designed to minimize increased ease of access in the project area, any development in the more remote parts of the project area in particular will inevitably see some increase in ease of access to these areas. Lone Pine has cooperated with the ranching community and provincial agencies on this question, and has expressed a willingness to experiment with various approaches, including route designations and locked gates. Applicability and success of these and other approaches can only be evaluated over time. If the project is approved, Lone Pine would be required to continue cooperation with relevant provincial agencies, affected Rural Municipalities, land owners/occupants, and other affected parties, and to implement such additional measures as might become necessary in future.

Surface water resources in the sand hills are generally sparse, intermittently available, and of poor quality. Shallow ground water of substantially better quality underlies much of the area. It is this groundwater resource which

allows construction of shallow wells and dugouts in the area and which plays an essential role in existing use of the area by both cattle and wildlife. Potential contamination of the groundwater during all drilling in the area is avoided by enforcing strict drilling regulations, including containment of all drilling fluids. All drilling fluids with any toxic capability must be confined in steel tanks wherever sandy soil or shallow groundwater is encountered. Disposal of these used fluids, which are essentially fertilizer compounds, is permitted on the drilling lease or on lease roads according to loading-rate formulae based on the materials involved, concentrations, soil type, and ability of the plants to incorporate the nutrients. Potentially more toxic materials, such as potassium chloride (KCl), must be disposed off-lease, either in deep injection wells or in evaporation/disposal facilities approved for this use following a rigorous site evaluation and review. Lone Pine has proposed the use of KCl only as their least-preferred drilling fluid formulation. Saskatchewan Environment and Public Safety believes these procedures, coupled with on-site regulatory supervision by Saskatchewan Energy and Mines, will ensure full groundwater protection.

A Heritage Resources Impact Assessment (HRIA) was undertaken by Lone Pine Resources Ltd. A subsequent report indicated that only one site presented concern which would require additional monitoring during the construction phase.

Saskatchewan Environment and Public Safety emphasizes the role of the proponent's on-site environmental monitor in ensuring high standards of environmental protection if the proposed

project is approved. The monitor's role would include detailed attention to the various specific details of project implementation. The monitor additionally would assume a general oversight role to ensure that the full range of environmental-protection measures identified in the EIS are incorporated. Additionally, a monitor's role includes identifying and resolving or reporting to governmental agencies any unanticipated environmental concerns which may arise.

4.0. SOCIO-ECONOMIC CONSIDERATIONS

If approved, the project would create employment in the Fox Valley - Maple Creek area, mainly during construction. Economic benefits would accrue to the local area and the province during construction. Local benefits would also occur during operation due to lease rentals, employment, and municipal taxes. Provincial revenues during operation would include royalties, payroll taxes and surface and mineral lease rentals.

Potential impacts on the aesthetic character of the area are considered to be minor. Above-ground installations in the sand hills area would be small, local and unobtrusive. Following reclamation, fences would be removed and wellsites and rights-of-way would be revegetated in a manner that renders them floristically similar to the surrounding areas. Access trails, while low-profile, will have an adverse impact on the wilderness character of the area, with this effect being most noticeable in the more remote parts of the project area.

The proposed gas development would have various impacts on existing ranching and other land uses, in addition to the economic benefits noted above. Creation of new or upgraded access, short-term removal of small areas from grazing, possible creation of new water supplies, and implications for the "wilderness" nature of the area are predicted. Each of these has positive and negative implications. In terms of changes such as surface disturbance, access, and changes from the original ecological characteristics of the area, both gas development and cattle ranching often have similar impacts. The extent and significance of such impacts in an area such as the Great Sand Hills are very dependant on the commitment of the land user to undertake these activities in such a way as to minimize the changes associated with the activity. Available evidence indicates that impacts associated with gas development, ranching, and certain recreational and other land uses in the Great Sand Hills region have not in general caused major, irreversible and unacceptable changes to the area.